

## **The Electrostatic Levitation Facility at NASA's Marshall Space Flight Center**

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Containerless processing is an important area of research in materials science. Electrostatic levitation (ESL) represents an emerging technology which permits containerless processing in a vacuum environment. NASA's Marshall Space Flight Center (MSFC) established a levitation facility to provide a critical resource to the microgravity materials science research community to continue to enhance ground-based research in the support of the development of flight experiments during the transition to Space Station.

During ESL processing, charged specimens are levitated in the electrostatic field produced by the system's electrodes. Three sets of positioning electrodes represent the heart of the MSFC system. Two dual-axis position sensitive detectors provide input for the PID control-loop computer. Sample position is maintained by adjusting the control voltages for the power supplies of the positioning electrodes. A UV source refreshes the charge on specimens during processing via the photoelectric effect. Lasers permit sample heating independent of positioning. The processing chamber typically operates under vacuum condition  $\cong 10^{-7}$  Torr.

Electrostatic levitation provides a materials science research tool for investigations of refractory solids and melts. Topics of investigation include thermophysical properties, phase equilibria, metastable phase formation, undercooling and nucleation, time-temperature-transformation diagrams and other aspects of materials processing. Current capabilities and recent results of processing studies for metals, alloys and oxides will be reviewed.